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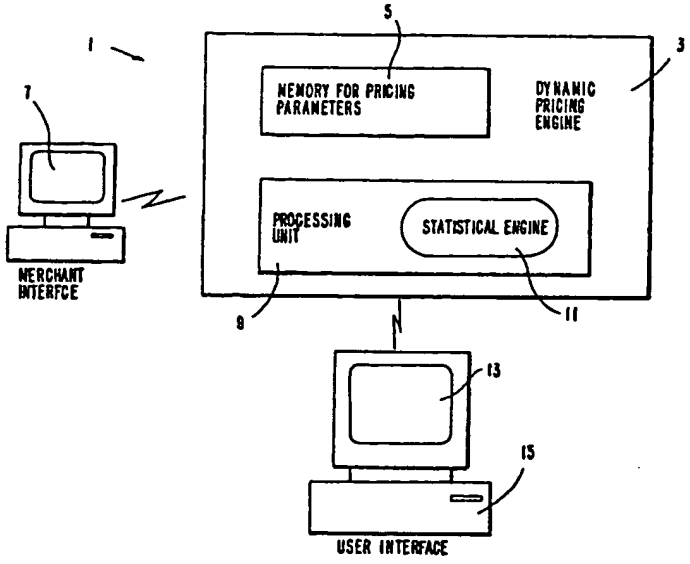
(54) Title: E-COMMERCE PRICING ENGINE



(57) Abstract: Methods and apparatus (1) comprising a dynamic pricing engine (3), merchant/seller's interface (7), consumer/buyer's monitor (13) and an interface (15), the interface may be an input device, typically a keyboard or a mouse, for setting prices between a buyer and a seller over a computer link, which may provide a substantial discount to the individual buyer while assuring an eventual preferred distribution of prices to the seller. The method allows a buyer and a seller to agree upon a price selected from prices having a statistical or probabilistic weighting.

WO 01/54017 A1

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E-COMMERCE PRICING ENGINE

Field of the Invention

This invention relates to methods for dynamically setting prices between a buyer and a seller over a computer link. Further it relates to methods for a buyer and a seller to set a price employing a statistical or probabilistic weighting.

Background of the Invention

With the availability of the internet, large numbers of customers for products can make purchases over the merchant/seller's web site. The ecommerce technology for such purchases is well known. Using HTML or similar descriptors and sophisticated programs in the Java language, a web page designer can provide an attractive, informative display of the product or services offered for sale, a search engine for searching a database of the available products to locate possible other purchases, market basket software for enabling the customer to accumulate several purchases during a single web site visit, a secure format for allowing the customer to confidentially disclose credit information, a method for debiting the customer's credit account, and a method for delivering the selected products to the customer, advising the customer of the status of the purchases and generally maintaining e-mail communication with the customer to encourage future purchases. These features emulate in a more convenient format the same type of transactions that occurred prior to the general availability of the internet and the world wide web.

There have been some advances that have taken advantage of the internet to provide services that could not effectively be provided prior to its existence. For example, applications have been developed to allow soliciting bids for products from many customers to be presented to a set of vendors who may be willing to compete to accept some of the bids, trading price for volume. This is typically the role of

agents, but the internet has greatly facilitated the process. Such applications may provide a system with variable prices for the products being vended.

The success of such a system relies upon the possibility that a vendor can be found who is willing to accept tendered bids. On the other hand, a system in which the vendor makes offers of definite discounts will encourage price competition between the vendors thereby driving down the profitability for the individual vendor. This competition defeats customer loyalty to any particular website vendor. The ease of switching from one vendor to the other greatly favors the customer. Indeed, web sites have developed that search among the vendors for specific products and produce a listing of prices for the products from which the customer can choose by clicking a mouse on a hypertext link to the least expensive vendor. To encourage customers to remain faithful to a particular vendor requires providing something extra at a particular website or saturating the customer with advertising so that the customer instinctively returns to that site. Such advertisement and extra are a significant drain on the resources of any vendor, and forces prices up, which threatens the market share that the advertising or extra was designed to provide.

What is lacking in the prior art is a system whereby an individual customer can be presented with prices of articles that are attractive to the customer but do not inspire searching for alternative and perhaps lower prices.

Facing the online merchant/sellers is a dilemma: they offer lower prices than physical stores and yet cannot cut their losses with such low prices. They cannot raise the fixed prices as the sales volume will go down. This invention solves this problem by allowing online merchant/seller to raise the average prices without losing the sales volume.

Brief Description of the Invention

The present invention provides a variety of pricing systems for use on any

computer generated system for dynamically setting the price between a merchant/seller and a customer. It is particularly suitable for web based commerce on the internet. The invention allows the merchant/seller to predetermine a target average price which will be received as the average of a large number of agreements with customers, while at the same time offering the customer the distinct possibility of receiving significant reductions of price by beating the odds of paying the target average price. This is done in a manner such that the target average price need not be disclosed to the customer.

There are several embodiments of the invention.

The invention is a pricing system having a dynamic pricing engine with a memory for storing various pricing parameters. This engine generates random variables and performs calculations required to operate the system.

There are several different embodiments of the invention. A dynamic pricing engine receives price parameters for each article offered for sale comprising a list price and a target average price. The processing unit contains the statistical engine which generates offering prices having a statistical distribution determined by said price parameters. The consumer/buyerconsumer/buyer determines whether to accept any offered price. The processing unit continues to provide alternative prices having the target average price as their mean until one is accepted by the consumer/buyer or until a number of offering prices have all been rejected. Such number of offering may be dynamic and beyond consumer/buyer's knowledge.

The statistical distribution of prices can be a uniform random or pseudo-uniform distribution, a normal or pseudo-normal distribution. It is preferred for normal distribution to have a standard deviation equal to the half the difference of the list price and the target average price. The merchant/seller can thus control the varying prices so that the average sales price is close to the target average price. The chance, however, that each customer can get very low prices will bring more

customers to the merchant/seller's web site. In addition, the parameters may be adjusted to adaptively update the system.

Another embodiment of the invention is a bidding engine in which the consumer/buyer has the possibility that some low bids will be accepted. A toughness parameter essentially controls the difficulty of a very low bid being accepted.

In another embodiment of an offering engine, the merchant/seller makes the offers. The merchant/seller sets price parameters. The system calculates an interval having the target average price as its central value and the list price as its upper value. The merchant/seller makes offers chosen at random in the interval, until a proposed price is accepted or some number of proposed prices have been offered. Such number may be dynamic and beyond consumer/buyer's knowledge.

Still another embodiment of the invention employs a Vickery auction involving several bidders. The winner of the bidding pays the second highest bid.

Yet another embodiment of the invention is an nonincentive negotiation engine. In this embodiment, the parameters utilized include a list price, a target average price, a bottom price, and a toughness parameter, and a determined number. The list price is first offered. If rejected, then the consumer/buyer is given a chance to make an offer that, as previously, is tested against a toughness parameter. If this does not result in acceptance then an interval is calculated. The merchant/seller then proposes a price which is a random value within the interval. The number of rounds of negotiation may be fixed or dynamically decided and is beyond the consumer/buyer's knowledge.

Another embodiment of the invention is an incentive negotiation engine. In this embodiment, the parameters utilized include a list price, a target average price, a bottom price, and a determined number for the rounds of negotiation, probability for deep discount, deep discount percentage. The list price is first offered. Then the

consumer/buyer is given a chance to make an offer. If the consumer/buyer offer is higher than the target average price, it will be accepted. Otherwise an interval is set between the previous merchant/seller offer price (list price for the second merchant/seller offer) and the target average price. The merchant/seller then proposes a price which is a random value within the interval. At each round of negotiation, the merchant/seller may offer deep discount, instead of calculated counter offers, at low but significant chances. The number of rounds of negotiation may be fixed or dynamically decided and is beyond the consumer/buyer's knowledge.

Brief Description of the Drawings

Figure 1 depicts the components of pricing system of the present invention.

Figure 2 depicts the operation of a dynamic pricing engine of the present invention.

Figure 3 depicts the operation of a dynamic pricing engine of the present invention which applies intelligence to the operation of the engine.

Figure 4 depicts the operation of a bidding engine for consumer/buyer bidding.

Figure 5 depicts the operation of a bidding engine where the seller makes offers.

Figure 6 depicts the operation of a bidding engine with multiple bidders at a Vickery auction.

Figure 7 depicts the operation of a negotiation engine without an incentive factor.

Figure 8 depicts the operation of a negotiation engine with an incentive factor.

Detailed Description of Preferred Embodiments

The invention will now be described by reference to the various figures and by presenting several examples of its operation. As shown in Fig. 1 the invention is embodied in pricing system 1, which comprises a dynamic pricing engine 3, which typically resides in a desktop computer at the merchant/seller's location, which has access to the internet and maintains an e-commerce website that offers his products to potential customers. The pricing engine 3 comprises a memory 5, in which the merchant/seller may store various pricing parameters. To accomplish this the merchant/seller employs a merchant/seller interface 7, which may be a graphical window with a keyboard, mouse or other input device that can access the pricing engine either directly or remotely. The pricing engine 3 further comprises a processing unit 9, which typically comprises the motherboard of the computer and its related devices and software. The pricing engine runs software which is loaded into a RAM memory for execution and which functions as a statistical engine 11. This engine is capable of performing calculations to generate the random variables required by the pricing system and to perform the calculations required to maintain the system. The consumer/buyer of the system is remotely connected to the pricing engine by the internet. The web page maintained by the merchant/seller appears on the consumer/buyer's monitor 13, to which the consumer/buyer may respond on its consumer/buyer interface 15, which may be any input device, typically a keyboard or mouse.

Although the invention is described in terms of the internet it is clear that any processor controlled system could be substituted. Thus the invention could be practiced by other connections between the consumer/buyer and the merchant/seller such as telephone, pager or any input/output device that permits the consumer/buyer to receive and respond to offers from the merchant/seller. For example, a cellular phone or palm computing device displaying pricing information could suffice.

Indeed, it is not necessary that the display be visible: it could for example be aural as well. To encompass all these different technologies we will, for purposes of this patent, define the term internet and web page to encompass each of these analogous technologies and others that may have suitable functionality.

Several different embodiments of the invention will be described. Figure 2 depicts the logic for a dynamic pricing engine. To operate the dynamic pricing engine a merchant/seller utilizes its input price parameters 17 for each article offered for sale. These parameters comprise a list price and a target average price. The list price can be manufacture suggested price, and is usually too high to attract many customers. The target average price is typically what the merchant/seller would hope to receive lower than the list price as the average price from many customers. The other parameters are whatever is necessary to determine a distribution of prices for the article. Although the preferred embodiment of the invention is an engine that calculates prices having a certain statistical distribution, it is possible to simply store a table of prices and rather than perform calculations to select the prices from among those stored. In such a situation the stored prices would be considered the parameters that determine the distribution of prices and the terms statistical distribution should be understood as also referring to the distribution of such stored prices.

The processing unit contains the statistical engine which generates one or more offering prices having a statistical distribution determined by said price parameters. The consumer/buyer is presented with these prices on its monitor and determines whether it is satisfied with the price. Typically the article for sale is depicted as an icon and the consumer/buyer selects the article by clicking its mouse on the article. If the consumer/buyer declines to accept the asking price of article the processing unit continues to provide alternative prices having the target average price as their mean until one is accepted by the consumer/buyer or until a number of

offering prices have all been rejected, which number is either predetermined and provided as one of the parameters provided by the merchant/seller or calculated statically by the processing unit. Such number can be dynamic and beyond consumer/buyer's knowledge.

The statistical distribution of prices is preferably a uniform random or pseudo-uniform distribution. By pseudo-uniform is meant a pattern of values that have no immediately discernable pattern of values; they need not be perfectly uniform. Also preferred is a normal or pseudo-normal distribution. Here pseudo-normal refers to a distribution that strongly resembles the bell shaped distribution characteristic of a normal distribution. In this case it is preferred that the statistical distribution have a standard deviation equal to half the difference of the list price and the target average price.

To generate a uniform distributed price, the following formula is used:

$$a + u(b-a)$$

where u is a uniformly distributed random variable having a range between 0 and 1 and a is the difference of twice the target price and the list price and b is the list price. Here we assume that the target price is more than half the list price.

To generate pseudo-normal values it is convenient to employ an approximation that will generate such values from a uniformly random array. Thus if the desired mean is μ and the standard deviation is σ the statistical engine determines the offering prices from the formula

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where u is a uniformly distributed random variable having a range between 0 and 1. This may be implemented by choosing the mean to be the target average price TP and the standard deviation to be (LP - TP)/2, where LP is the list price. The customer may also be confined to prices in the range between LP and 2TP-LP which is a symmetric interval about the mean.

The merchant/seller can thus control the varying prices so that the average sales price is close to the target average price. The chance, however, that each customer can get very low prices will bring more customers to the merchant/seller's web page.

In addition, as shown in Fig.3, the system can be programmed to retain the results of the customer's acceptances and refusals and to adjust the parameters to adaptively update the system. The calculations necessary to adjust the parameters to obtain a desired distribution of prices is essentially the inverse of the problem of calculating probabilities from the parameters. Methods for doing such calculations are well known as the Bayes Theorem. See, e.g. Fristedt and Gray, "A Modern Approach to Probability Theory", 1997, p. 730. The technique involves the steps of generating price offers, observing the customer's response, update the parameters using Bayes Theorem, compute predictive probabilities of customer purchase, modify the probabilities to achieve the target average price as the mean and repeat the process until the target average price is achieved as the mean.

Another embodiment of the invention is a bidding engine in which the consumer/buyer makes a series of bids which the merchant/seller has the option of accepting or rejecting based on a certain criteria. To encourage the consumer/buyer there is the possibility that some low bids will be accepted. As shown in Fig. 4, the merchant/seller inputs price parameters for each article offered for sale, the parameters preferably including a list price, a target average price, a bottom price, minimum price increment, a toughness parameter, and a determined number. The toughness parameter essentially controls the difficulty of a very low bid being accepted. When the bid is received from the consumer/buyer, it is accepted if it exceeds the target average price. Otherwise, if the price offer from the consumer/buyer did not exceed the target average price, a function of the price offer and the other price parameters is compared to a value randomly dependent upon the

toughness parameter, and the offer is accepted if it bears a predetermined relationship to the value. To give a preferred example, if the toughness parameter is a numerical value T, then the step of comparing the price offer to a value randomly dependent on the toughness parameter may be generating a random fraction and accepting the price offer if the ratio of the difference between the offered price and bottom price to the difference between the target average price and the bottom price exceeds the T^{th} root of the random fraction, i.e. if the random fraction (by fraction we mean a value between 0 and 1 in this example) u satisfies

$$u < [(CP-BP)/(TP-BP)]^T.$$

where CP is the consumer/buyer's offer, BP is the bottom price and TP the target average price. The random fraction u is selected from a uniform statistical distribution of fractions over the unit interval. If the price offer is not accepted, then the process is repeated until a proposed price is accepted or a determined number of proposed prices have been offered. Such number may be dynamic and beyond consumer/buyer's knowledge. Preferably, each successive bid from the consumer/buyer must exceed the previous bid by the minimum price increment.

Fig. 5 shows an embodiment of offering engine where the merchant/seller makes the offers. The merchant/seller sets price parameters for each article offered for sale, such as a list price, a target average price, and a determined number (used to end the number of offers the merchant/seller will consider from the consumer/buyer). The system calculates an interval having the target average price as its central value and the list price as its upper value. The merchant/seller makes offers chosen at random in the interval, and keeps this up until a proposed price is accepted or the determined number of proposed prices have been offered. If the determined number of proposed prices have been offered, the process ceases. Such number may be dynamic and beyond consumer/buyer's knowledge.

The distribution of the random prices may be according to any preferred

statistical model. For example they may be uniformly or pseudo-uniformly, normally or pseudo-normally distributed.

For uniform distribution, the offering price has the following formula:

$$a + u(b-a)$$

where u is a uniformly distributed random variable having a range between 0 and 1 and a is the difference of twice the target average price and the list price and b is the list price. Here we assume that the target price is more than half the list price.

Still another embodiment of the invention employs a Vickery auction. As depicted in Fig. 6, this involves several bidders. The merchant/seller sets a time limit and accepts bids from the bidders, completing a payment process for each bidder. The highest bidder is then charged the second highest price. A receipt is then emailed to the winner and the other bidders are not charged.

Yet another embodiment of the invention termed a nonincentive negotiation engine is shown in Fig. 7. In this embodiment, the parameters utilized are a list price, a target average price, a bottom price, minimal price increment, a toughness parameter, and a determined number. The list price is first offered. If this is accepted then the negotiation ends. Otherwise the consumer/buyer proposes a price. This is accepted if it exceeds the target average price. If it does not the offer is accepted if it exceeds a value randomly based on the toughness parameter. Specifically, if the toughness parameter is a number T, a random fraction is generated and the offer is accepted if the ratio of the difference between the offered price and bottom price to the difference between the target average price and the bottom price exceeds the T^{th} root of the random fraction. In other words, there is acceptance if, as previously,

$$u < [(CP-BP)/(TP-BP)]^T.$$

where CP is the consumer/buyer's offer, BP is the bottom price and TP the target average price. If this does not result in acceptance the merchant/seller will make a

counter offer based on any statistical distribution or model. Two preferred examples are the uniform distribution and pseudo-normal distribution.

For uniform distribution, the merchant/seller offering price has the following formula:

$$a + u(b-a)$$

where u is a uniformly distributed random variable having a range between 0 and 1 and a is and the greater of (1) the average of the price offer from the consumer/buyer and the previous merchant/seller proposed price (list price if the second round), or (2) the target average price and b is previous merchant/seller proposed price (list price if the second round).

For pseudo-normal distribution, the merchant/seller offering price is

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where μ is the average of the target price and the previous merchant/seller offer price (list price if the second round), and σ is a quarter of the difference of the previous merchant/seller offer price (list price if the second round) and the target average price. If this is not accepted, the consumer/buyer is asked to make another offer and the process is repeated from the point where it is compared to the target average price. This is repeated until a proposed price is accepted, the consumer/buyer chooses to stop the process or a determined number of proposed prices have been offered. Such number can be dynamic and beyond consumer/buyer's knowledge. Preferably, each successive proposed price from the consumer/buyer must exceed the previous proposed price by the minimum price increment.

Yet another embodiment of the invention termed an incentive negotiation engine is shown in Fig. 8. In this embodiment, the parameters utilized are a list price, a target average price, a bottom price, minimum price increment, probability to offer a deep discount, the deep discount percentage, and a determined number. The list price is first offered. If this is accepted then the negotiation ends. Otherwise the

consumer/buyer proposes a price. This is accepted if it exceeds the target average price. Otherwise the engine will make a counter offer.

If the low but significant chance of deep discount occurs, in other words u < Pbr where u is a uniformly distributed random variable having a range between 0 and 1 and Pbr is the probability to offer deep discount, the merchant/seller offer price is

$$LP(1-Pcnt)$$

Where LP is the list price and Pcnt is deep discount percentage.

If the deep discount does not happen, merchant/seller will make a counter offer price based on any possible statistical distribution or models. Preferred examples are uniform and pseudo-normal distribution.

For uniform distribution, the offering price has the following formula:

$$a + u(b-a)$$

where u is a uniformly distributed random variable having a range between 0 and 1 and a is and the greater of (1) the average of the price offer from the consumer/buyer and the previous merchant/seller proposed price (list price if the second round), or (2) the target average price and b is previous merchant/seller proposed price (list price if the second round).

For pseudo-normal distribution, the offering price has the following formula

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where μ is the average of the target price and the previous merchant/seller offer price (list price if the second round), and σ is a quarter of the difference of the previous merchant/seller offer price (list price if the second round) and the target average price.

If this is not accepted, the consumer/buyer is asked to make another offer, greater by at least the minimum price increment, and the process is repeated from the point where it is compared to the target average price. This is repeated until a

proposed price is accepted, the consumer/buyer chooses to stop the process or a determined number of proposed prices have been offered. Such number can be dynamic and beyond consumer/buyer's knowledge.

As may be seen from the foregoing examples, the invention is very versatile and is not limited to any specific statistical model. The invention encourages consumer/buyers to make offers or consider offers in the hope of getting a low price. Within that broad concept many embodiments suggest themselves.

Although particular embodiments of the invention have been described, it will be apparent to persons of ordinary skill in the relevant arts that the invention may be practiced by modifications that do not depart from the substance of the invention. Accordingly the scope of protection of this patent should not be limited to the disclosed embodiments but should be determined from the following description of the invention in terms of claims.

What is claimed is:

1. An ecommerce pricing system in which a customer/user and a merchant/seller sets a price over a computer link in which the merchant/seller uses a statistical method to offer or accept a price based upon a statistical method.

2. A system for one consumer/buyer and one merchant/seller to negotiate a transaction price over the internet or other electronic or telecommunication link that on average provides the merchant/seller with at least a target average price.

3. A pricing system for articles offered for sale on a processor controlled output device comprising

a dynamic pricing engine for providing as output from said output device one or a sequence of prices, said dynamic pricing engine comprising

a merchant/seller interface to allow a merchant/seller to input price parameters for each article offered for sale, said parameters determining a distribution of prices for each said article,

a processing unit comprising a statistical engine for generating one or more offering prices, said offering prices having a statistical distribution determined by said price parameters,

a consumer/buyer interface for presenting on said output device an offering price associated with one of said articles, said offering price provided by said processing unit, said consumer/buyer interface further enabling the consumer/buyer to accept, reject or counter offer said offering price generated by said processing unit.

4. The pricing system of claim 3, wherein, after rejection of an offering price, said consumer/buyer interface continues to provide offering prices until one is

accepted by the consumer/buyer or until a number of offering prices have all been rejected, said number being predetermined or provided by said processing unit.

5. The pricing system of claim 4, wherein said number may be dynamic and beyond consumer/buyer's knowledge.

6. The pricing system of claim 4, wherein one of said input price parameters is a target average price and said statistical distribution is centered about said target average price.

7. The pricing system of claim 6, wherein said statistical distribution has a mean equal to the target average price.

8. The pricing system of claim 7, wherein said statistical distribution is a uniform random or pseudo-random distribution.

9. The pricing system of claim 7, wherein said statistical distribution is a normal distribution or pseudo-normal distribution.

10. The pricing system of claim 7, wherein said statistical distribution is a statistical or pseudo-statistical distribution.

11. The pricing system of claim 9, wherein one of the input price parameters is a list price and the statistical distribution has a standard deviation is equal to half the difference of the list price and the target average price.

12. The method of claim 8, wherein the random selection is made by randomly

selecting a value of a uniformly distributed fraction u and calculating

$$a+u(b-a)$$

where a is the lower limit (difference of twice the target price and the list price) and b is the upper limit (list price).

13. The method of claim 9, wherein the random selection is made by randomly selecting a value of a uniformly distributed fraction u and calculating

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where μ is the mean (Target Price), and σ is the standard deviation (half the difference of list price and target price).

14. A pricing system for articles offered for sale on an internet website comprising

a dynamic pricing engine for providing one or a sequence of offering prices for each article comprising

a merchant/seller interface to allow a merchant/seller to set price parameters, said parameters comprising for each article a list price, and a target average price,

a processing unit comprising a statistical engine/model for generating offering prices for each article, said offering prices having a pseudo-normal or uniform statistical distribution having a mean equal to the target average price, and a standard deviation equal to half the difference of the list price and the target average price, said statistical engine determining the offering prices by selecting values of a uniformly distributed random variable and converting said values to values of a pseudo-normal distribution or uniform distribution,

a consumer/buyer interface for selecting or rejecting prices generated by said statistical engine/model and for enabling the consumer/buyer to

accept or reject said offering price generated by said processing unit,

wherein, after rejection of an offering price, said consumer/buyer interface continues to provide offering prices until one is accepted by the consumer/buyer or until a number of offering prices have all been rejected, said number being predetermined or provided by said processing unit.

15. The pricing system of claim 14 wherein , said number can be dynamic and beyond consumer/buyer's knowledge.

16. The pricing system for articles offered for sale on an internet website of claim 14 wherein said statistical engine determines the offering prices from the formula

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where μ is the mean (target price), σ is the standard deviation (half the difference of list price and target price), and u is a uniformly distributed random variable having a range between 0 and 1.

17. The pricing system for articles offered for sale on an internet website of claim 14 wherein said statistical engine determines the offering prices from the formula:

$$a + u(b-a)$$

where a is the lower limit (the difference of twice the target price and the list price), b is the upper limit (list price), and u is a uniformly distributed random variable having a range between 0 and 1.

18. A method for negotiating a price for articles offered for sale on an internet website comprising the following steps until a proposed price has been agreed or the process ceased at step (g)

(a) setting price parameters for each article offered for sale, said parameters comprising a list price, a target average price, a bottom price, a toughness parameter, and a determined number,

(b) proposing to accept the list price,

(c) if the proposed price is not accepted, then receiving a price offer from a consumer/buyer and accepting it if it exceeds the target average price,

(d) if the price offer from the consumer/buyer did not exceed the target average price in step (c) then comparing the price offer to a value randomly based on the toughness parameter, and accepting the offer if it bears a predetermined relationship to the value randomly based,

(e) otherwise, establishing an interval between the proposed price and the greater of (1) the average of the price offer from the consumer/buyer and the previous merchant /seller proposed price, or (2) the target average price, recalculating the proposed price to be a random value within the interval, and counter-offering the proposed price,

(f) if the counter-offer is not accepted repeating the process from step (c) until a proposed price is accepted, the consumer/buyer chooses to stop the process or a determined number of proposed prices have been offered.

(g) if the determined number of proposed prices have been offered, ceasing the process.

19. The method for negotiating a price for articles offered for sale on an internet website of claim 18, wherein such number can be dynamic and beyond consumer/buyer's knowledge.

20. The method for negotiating a price for articles offered for sale on an internet website of claim 18, wherein

the toughness parameter is a numerical value T, and

the step of comparing the price offer to a value randomly based on the toughness parameter comprises

generating a random fraction and accepting the price offer if the ratio of the difference between the consumer/buyer offered price and bottom price to the difference between the target average price and the bottom price exceeds the T^{th} root of the random fraction.

21. The method of claim 20 wherein said random fraction is selected from a uniform statistical distribution of fractions over the unit interval.

22. The method of claim 20, wherein said merchant/seller proposed price is randomly selected from a normal or pseudo-normal statistical distribution or uniform distribution of prices having a mean equal to the central value of the interval, and a standard deviation equal to a quarter of the length of the interval.

23. The method of claim 22, wherein the random selection is made by randomly selecting a value of a uniformly distributed fraction u and calculating

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where μ is the mean, and σ is the standard deviation, or

24. The method of claim 21, wherein the random selection is made by randomly selecting a value of a uniformly distributed fraction u and calculating

$$a+u(b-a)$$

where a is the lower limit of the interval and b is the upper limit of the interval.

25. The method of claim 20, wherein said proposed price is selected from a

normal or pseudo-normal distribution of prices having a mean μ of the last merchant/seller proposed price and the target average price, and a standard deviation σ equal to a quarter of the difference between the last merchant/seller proposed price and the target average price.

26. The method of claim 24, wherein said proposed price is selected from a uniform distribution of prices having the lower limit a the greater of (1) the average of consumer offer price and previous merchant/seller proposed price (list price if second round), or (2) the target price and the upper limit b equal to previous merchant/seller proposed price.

27. A method for negotiating a price for articles offered for sale on an internet website comprising the following steps until a proposed price has been agreed or the process ceased at step (f)

(a) setting price parameters for each article offered for sale,

(b) proposing to accept a list price,

(c) if the proposed price is not accepted, then receiving a price offer from a consumer/buyer and accepting it if it exceeds a target average price,

(d) otherwise, recalculating the proposed price to be a random value in an interval dependant upon the consumer/buyer price offer, and counter-offering the proposed price,

(e) if the counter-offer is not accepted repeating the process from step (c) until a proposed price is accepted, the consumer/buyer chooses to stop the process or a determined number of proposed prices have been offered,

(f) if the determined number of proposed prices have been offered, ceasing the process.

28. The method for negotiating a price for articles offered for sale on an internet website of claim 27, wherein such number is dynamic and beyond consumer/buyer's knowledge.

29. The method of claim 27, wherein said proposed price is randomly selected from a normal or pseudo-normal statistical distribution or uniform distribution of prices having a mean equal to the central value of the interval, and a standard deviation equal to a quarter of the length of the interval.

30. The method of claim 27, wherein the random selection is made by randomly selecting a value of a uniformly distributed fraction u and calculating

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where μ is the mean, and σ is the standard deviation.

31. The method of claim 27, wherein the random selection is made by randomly selecting a value of a uniformly distributed fraction u and calculating

$$a+u(b-a)$$

where a is the lower limit and b is the upper limit of the interval.

32. The method of claim 30, wherein said proposed price is selected from a normal or pseudo-normal distribution of prices having a mean μ of the last merchant/seller proposed price and the target average price, and a standard deviation σ equal to a quarter of the difference between the last merchant/seller proposed price and the target average price.

33. The method of claim 31, wherein said proposed price is selected from a uniform distribution of prices having the lower limit a the greater of (1) the

average of consumer/buyer offer price and previous merchant/seller proposed price (list price if second round), or (2) the target price and the upper limit b equal to previous merchant/seller proposed price.

34. The method of claim 27 further comprising substituting at random a deep discounted price instead of the statistically proposed price at any stage of the method.

35. The method of claim 34, wherein the substitution at random is made by providing a discount parameter, selecting at random a number, and giving a discount if the random number is below the discount parameter.

36. A method for setting a price for articles offered for sale on an internet website by determining when to accept an offer from a consumer/buyer comprising the following steps until a proposed price has been agreed or the process ceased at step (g)

(a) setting price parameters for each article offered for sale, said parameters comprising a list price, a target average price, a bottom price, a toughness parameter, and a determined number,

(b) receiving a bid from the consumer/buyer,

(c) accepting the bid if it exceeds the target average price,

(d) if the price offer from the consumer/buyer did not exceed the target average price in step (c) then comparing a function of the price offer and the other price parameters to a value randomly dependent upon the toughness parameter, and accepting the offer if it bears a predetermined relationship to the value randomly dependent,

(e) if the price offer is not accepted, then repeating the process from

step (b) until a proposed price is accepted or the determined number of proposed prices have been offered,

(f) if the determined number of proposed prices have been offered, ceasing the process.

37. The method for setting a price for articles offered for sale on an internet website of claim 36, wherein such number is dynamic and beyond the consumer/buyer's knowledge.

38. The method for negotiating a price for articles offered for sale on an internet website of claim 36, wherein

the toughness parameter is a numerical value T, and

the step of comparing the price offer to a value randomly dependent on the toughness parameter comprises

generating a random fraction and accepting the price offer if the ratio of the difference between the offered price and bottom price to the difference between the target average price and the bottom price exceeds the T^{th} root of the random fraction.

39. The method of claim 38 wherein said random fraction is selected from a uniform statistical distribution of fractions over the unit interval.

40. A method for setting a price for articles offered for sale on an internet website comprising the seller making offers according to the following steps until a proposed price has been agreed or the process ceased at step (e)

(a) setting price parameters for each article offered for sale, said parameters comprising a list price, a target average price, and a determined

number,

(b) choosing an interval having the target average price as its central value and the list price as its upper value,

(c) proposing to accept a price chosen at random in the interval,

(d) if the proposed price is not accepted, then repeating the process from (b) until a proposed price is accepted or a determined number of proposed prices have been offered,

(e) if the determined number of proposed prices have been offered, ceasing the process.

41. The method for setting a price for articles offered for sale on an internet website of claim 40, wherein such number is dynamic and beyond consumer/buyer's knowledge.

42. The method for setting a price for articles offered for sale on an internet website of claim 40, wherein the prices chosen at random are normally or pseudo-normally distributed or uniformly distributed.

43. The method of claim 40, wherein the random selection is made by randomly selecting a value of a uniformly distributed fraction u and calculating

$$\mu + \sigma\,[u^{0.135} - (1-u)^{0.135}]/0.1975$$

where μ is the mean (Target Price), and σ is the standard deviation (half the difference of list price and target price).

44. The method of claim 40, wherein the random selection is made by randomly selecting a value of a uniformly distributed fraction u and calculating

$$a+u(b-a)$$

where a is the lower limit (difference of twice the target price and the list price) and b is the upper limit (list price)

45. A method for negotiating a price for articles offered for sale on an internet website comprising

(a) setting a time limit and accepting bids from a plurality of bidders,

(b) completing a payment process for each bidder,

(c) picking the highest bidder and charging the second highest price

(d) emailing a receipt to the winner and not charging the other bidders.

46. The pricing system of claim 3, wherein the dynamic pricing engine modifies the input price parameters during operation of the system, in response to the responses of the consumer/buyer to the offering prices.

47. The method of claim 14, wherein the dynamic pricing engine modifies the input price parameters during operation of the system, in response to the responses of the consumer/buyer to the offering prices.

48. The method of claim 18, wherein the dynamic pricing engine modifies the input price parameters during operation of the system, in response to the responses of the consumer/buyer to the offering prices.

49. The method of claim 27, wherein the dynamic pricing engine modifies the input price parameters during operation of the system, in response to the responses of the consumer/buyer to the offering prices.

50. The method of claim 36, wherein the dynamic pricing engine modifies the input price parameters during operation of the system, in response to the responses of the consumer/buyer to the offering prices.

51. The method of claim 40, wherein the dynamic pricing engine modifies the input price parameters during operation of the system, in response to the responses of the consumer/buyer to the offering prices.

52. The method of claim 3, wherein the number of times such engines to be used each day for each machine/device can be set by merchant/sellers.

53. The method of claim 14, wherein the number of times such engines to be used each day for each machine/device can be set by merchant/sellers.

54. The method of claim 18, wherein the number of times such engines to be used each day for each machine/device can be set by merchant/sellers.

55. The method of claim 27, wherein the number of times such engines to be used each day for each machine/device can be set by merchant/sellers.

56. The method of claim 36, wherein the number of times such engines to be used each day for each machine/device can be set by merchant/sellers.

57. The method of claim 40, wherein the number of times such engines to be used each day for each machine/device can be set by merchant/sellers.

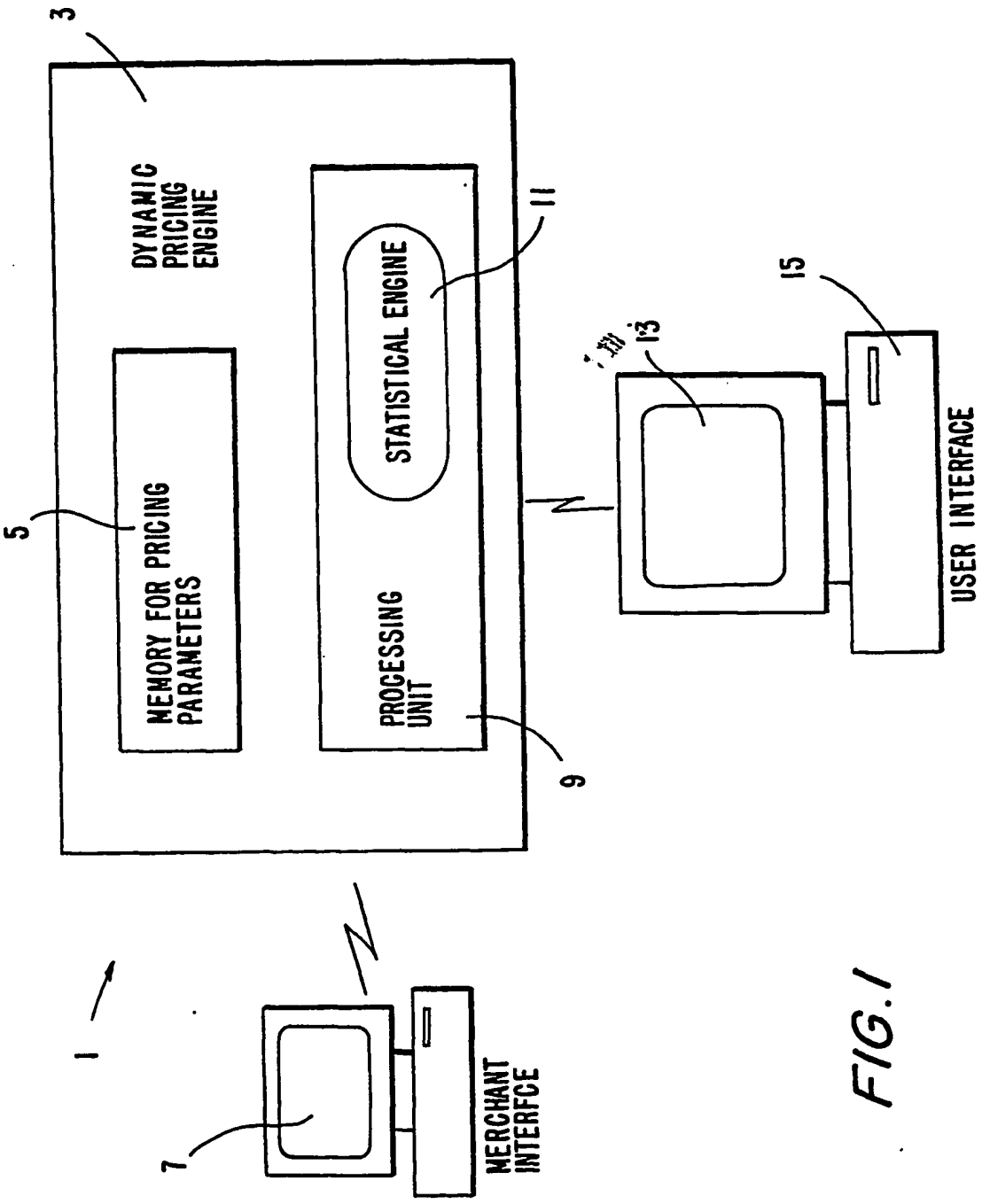

3
DYNAMIC PRICING ENGINE
STATISTICAL ENGINE
11
MEMORY FOR PRICING PARAMETERS
5
PROCESSING UNIT
9
13
15
USER INTERFACE
1
7
MERCHANT INTERFCE

FIG. 1

FIG. 2

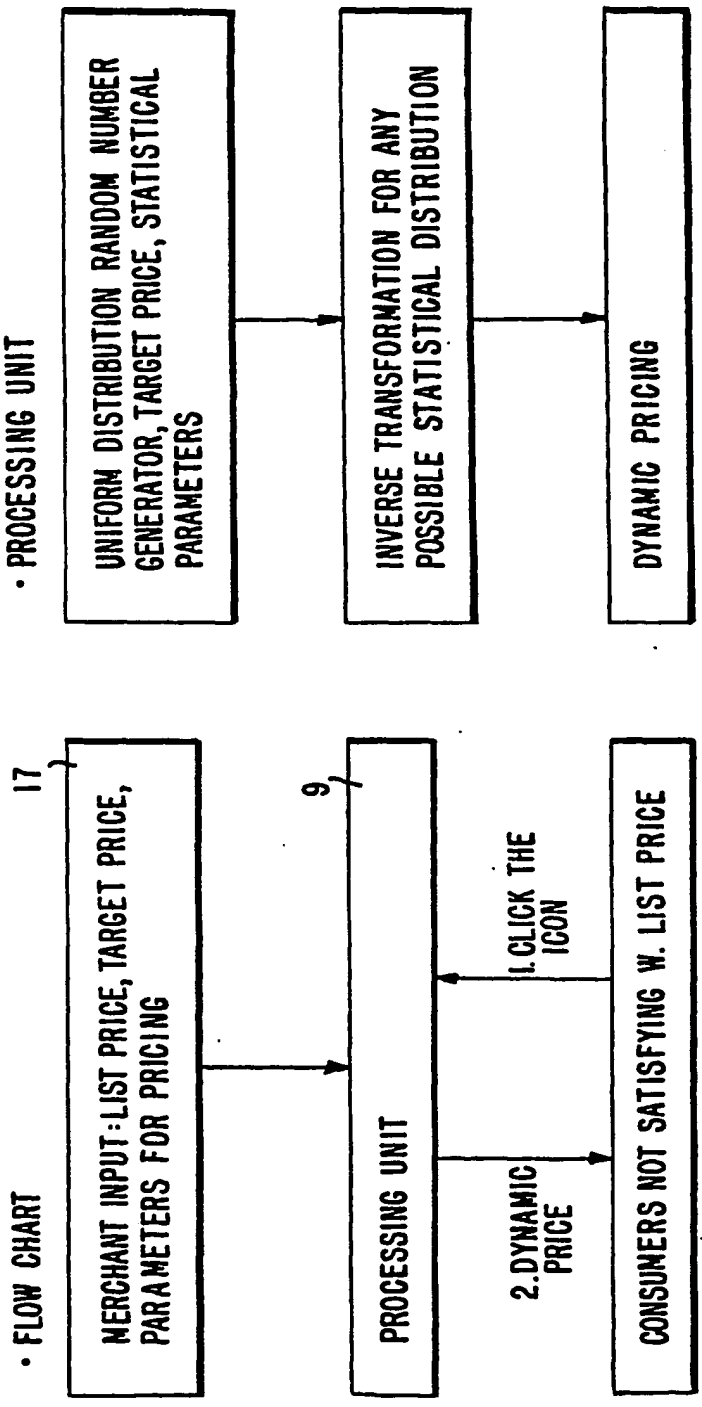
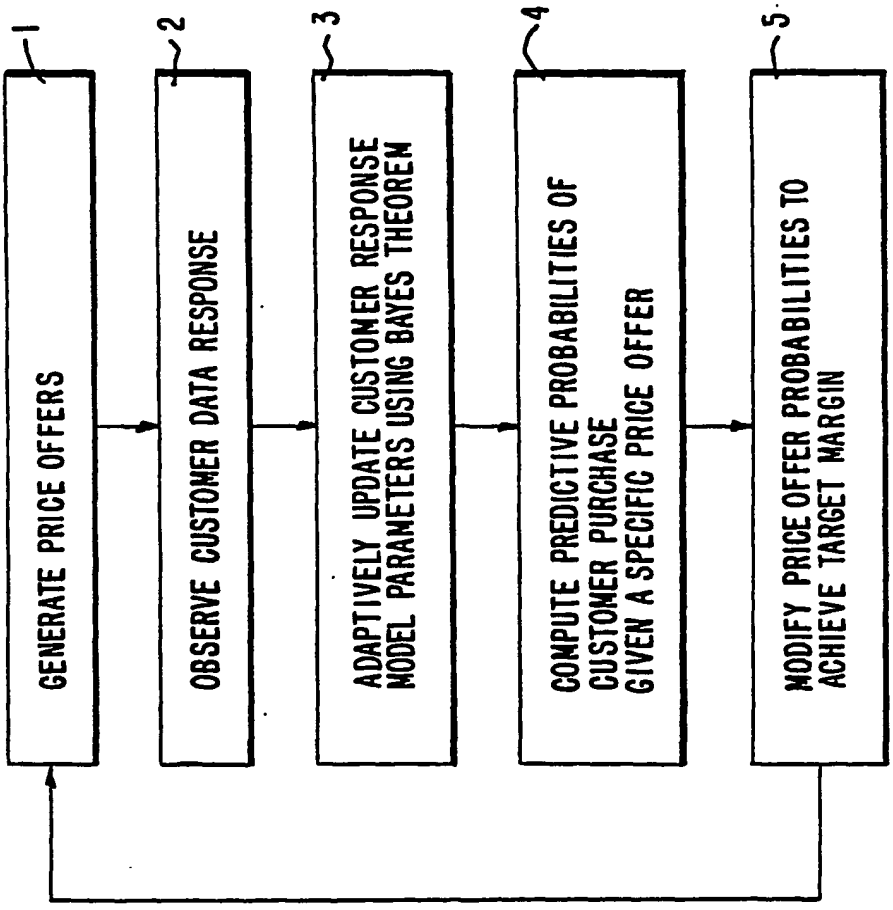

• PROCESSING UNIT
UNIFORM DISTRIBUTION RANDOM NUMBER GENERATOR, TARGET PRICE, STATISTICAL PARAMETERS
INVERSE TRANSFORMATION FOR ANY POSSIBLE STATISTICAL DISTRIBUTION
DYNAMIC PRICING
• FLOW CHART
17
MERCHANT INPUT: LIST PRICE, TARGET PRICE, PARAMETERS FOR PRICING
9
PROCESSING UNIT
1. CLICK THE ICON
2. DYNAMIC PRICE
CONSUMERS NOT SATISFYING W. LIST PRICE

FIG. 3


1
GENERATE PRICE OFFERS
2
OBSERVE CUSTOMER DATA RESPONSE
3
ADAPTIVELY UPDATE CUSTOMER RESPONSE MODEL PARAMETERS USING BAYES THEOREM
4
COMPUTE PREDICTIVE PROBABILITIES OF CUSTOMER PURCHASE GIVEN A SPECIFIC PRICE OFFER
5
MODIFY PRICE OFFER PROBABILITIES TO ACHIEVE TARGET MARGIN

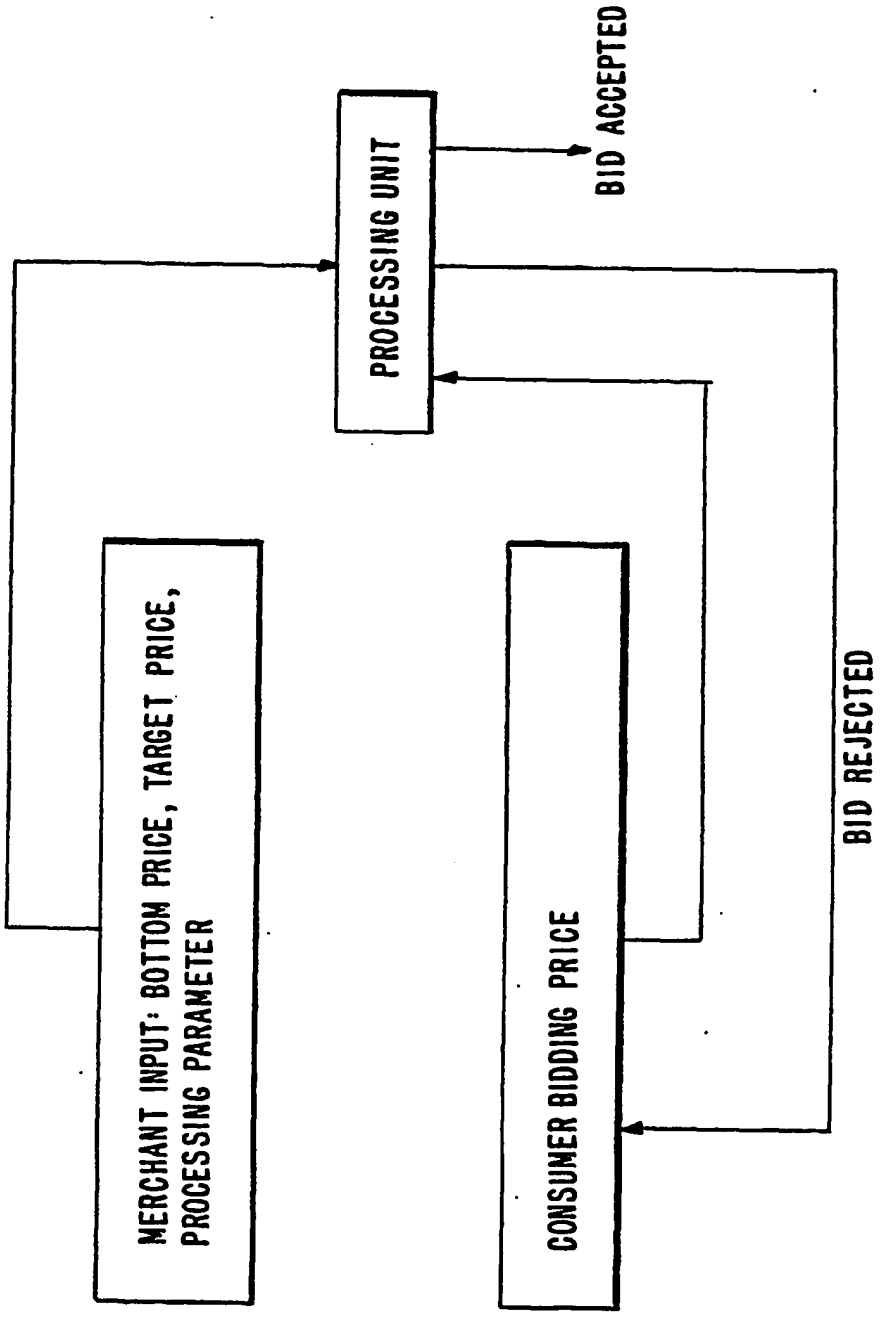

PROCESSING UNIT
BID ACCEPTED
MERCHANT INPUT: BOTTOM PRICE, TARGET PRICE, PROCESSING PARAMETER
CONSUMER BIDDING PRICE
BID REJECTED

FIG. 4

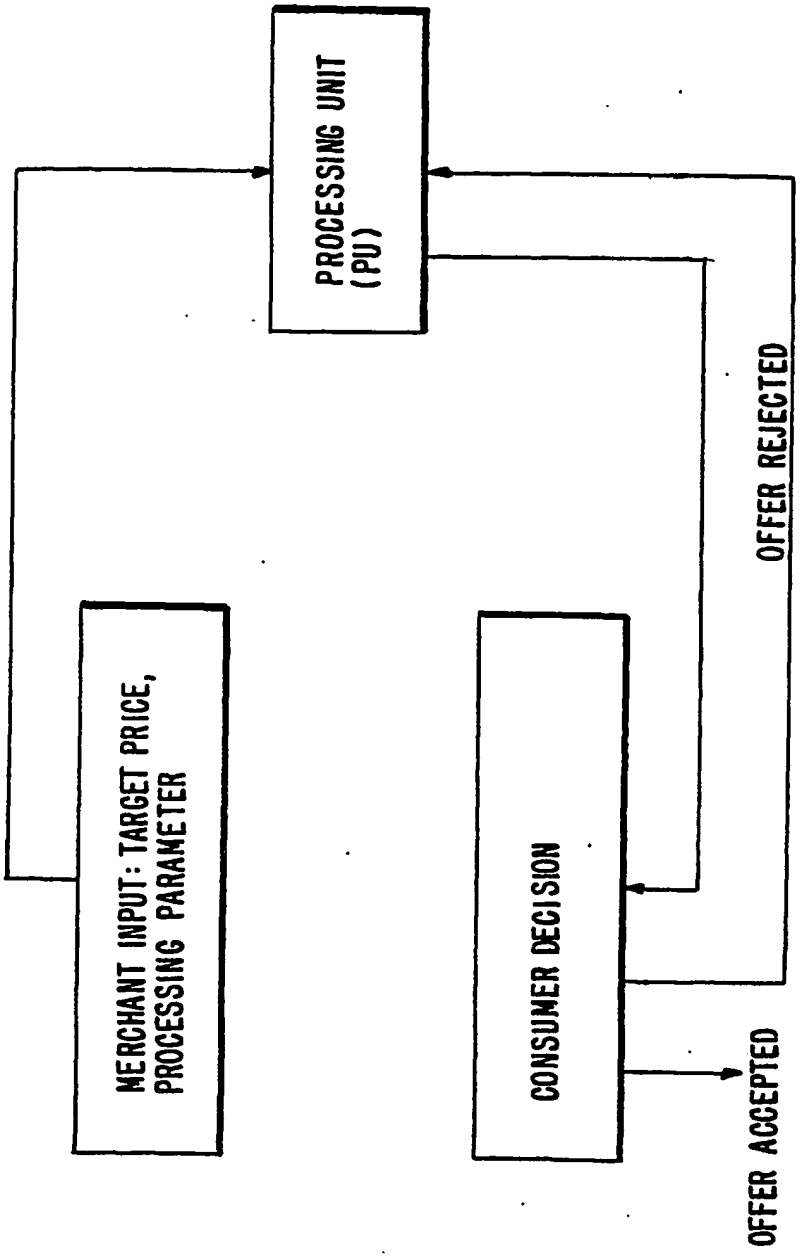

PROCESSING UNIT (PU)
MERCHANT INPUT: TARGET PRICE, PROCESSING PARAMETER
CONSUMER DECISION
OFFER REJECTED
OFFER ACCEPTED

FIG.5

FIG. 6

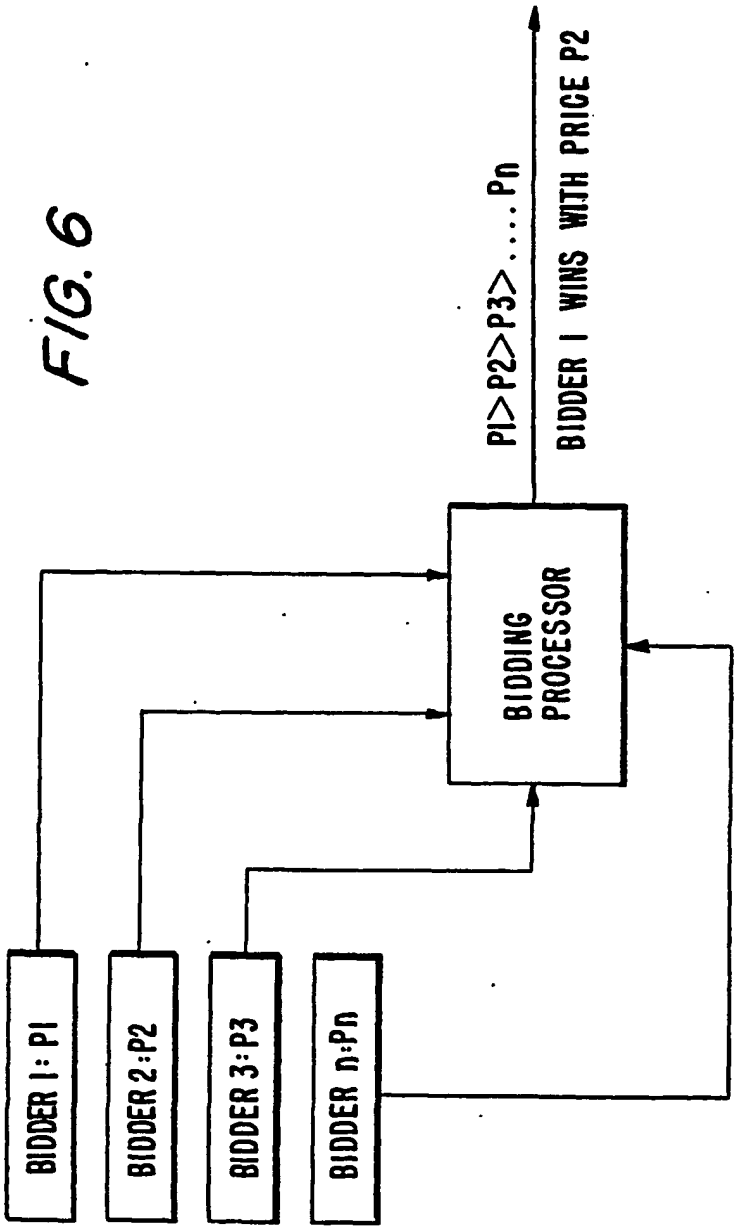
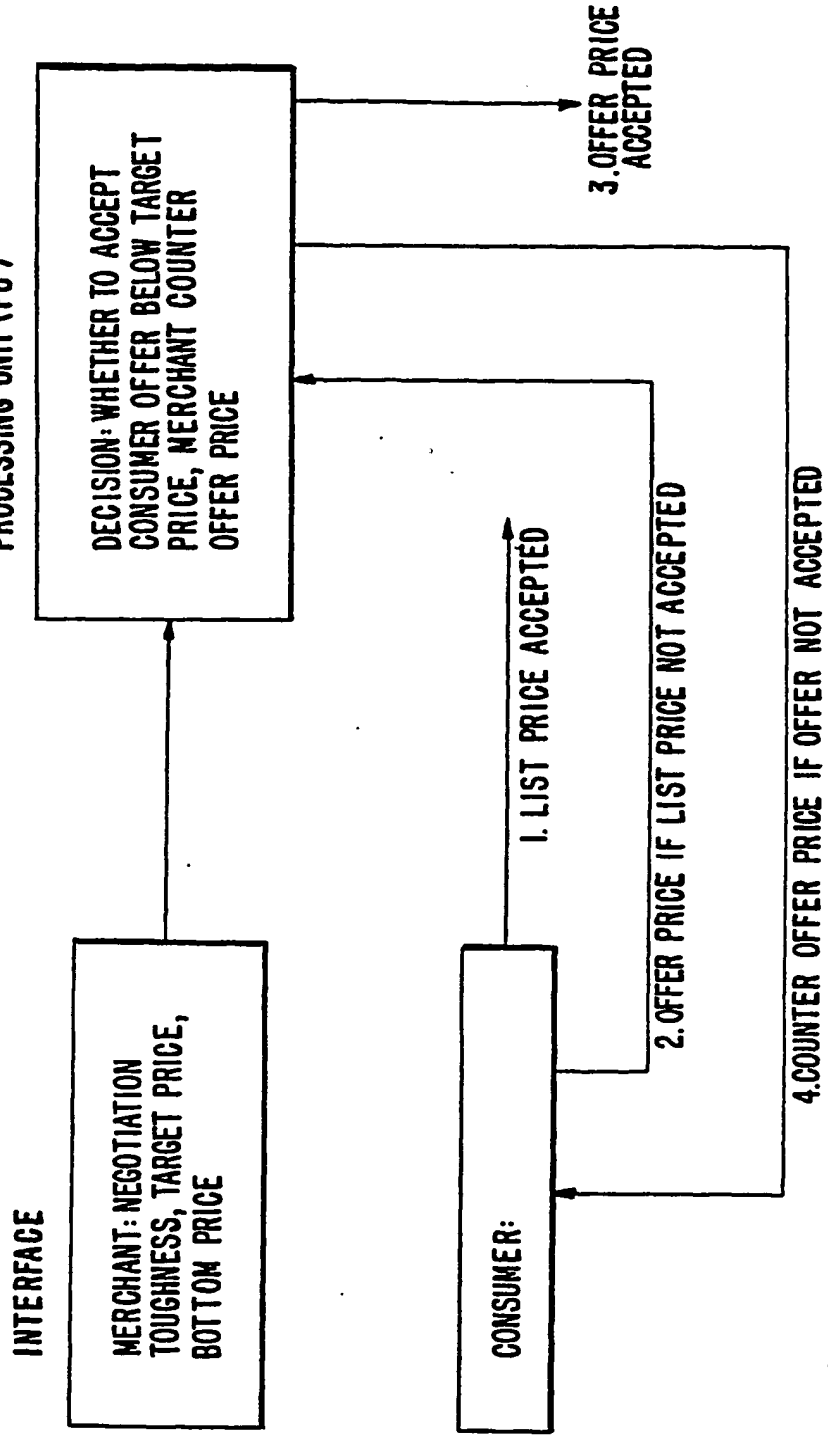

BIDDER 1: P1
BIDDER 2: P2
BIDDER 3: P3
BIDDER n: Pn
BIDDING PROCESSOR
P1>P2>P3>.....Pn
BIDDER 1 WINS WITH PRICE P2

FIG. 7


PROCESSING UNIT (PU)
DECISION: WHETHER TO ACCEPT CONSUMER OFFER BELOW TARGET PRICE, MERCHANT COUNTER OFFER PRICE
3. OFFER PRICE ACCEPTED
1. LIST PRICE ACCEPTED
2. OFFER PRICE IF LIST PRICE NOT ACCEPTED
4. COUNTER OFFER PRICE IF OFFER NOT ACCEPTED
INTERFACE
MERCHANT: NEGOTIATION TOUGHNESS, TARGET PRICE, BOTTOM PRICE
CONSUMER:

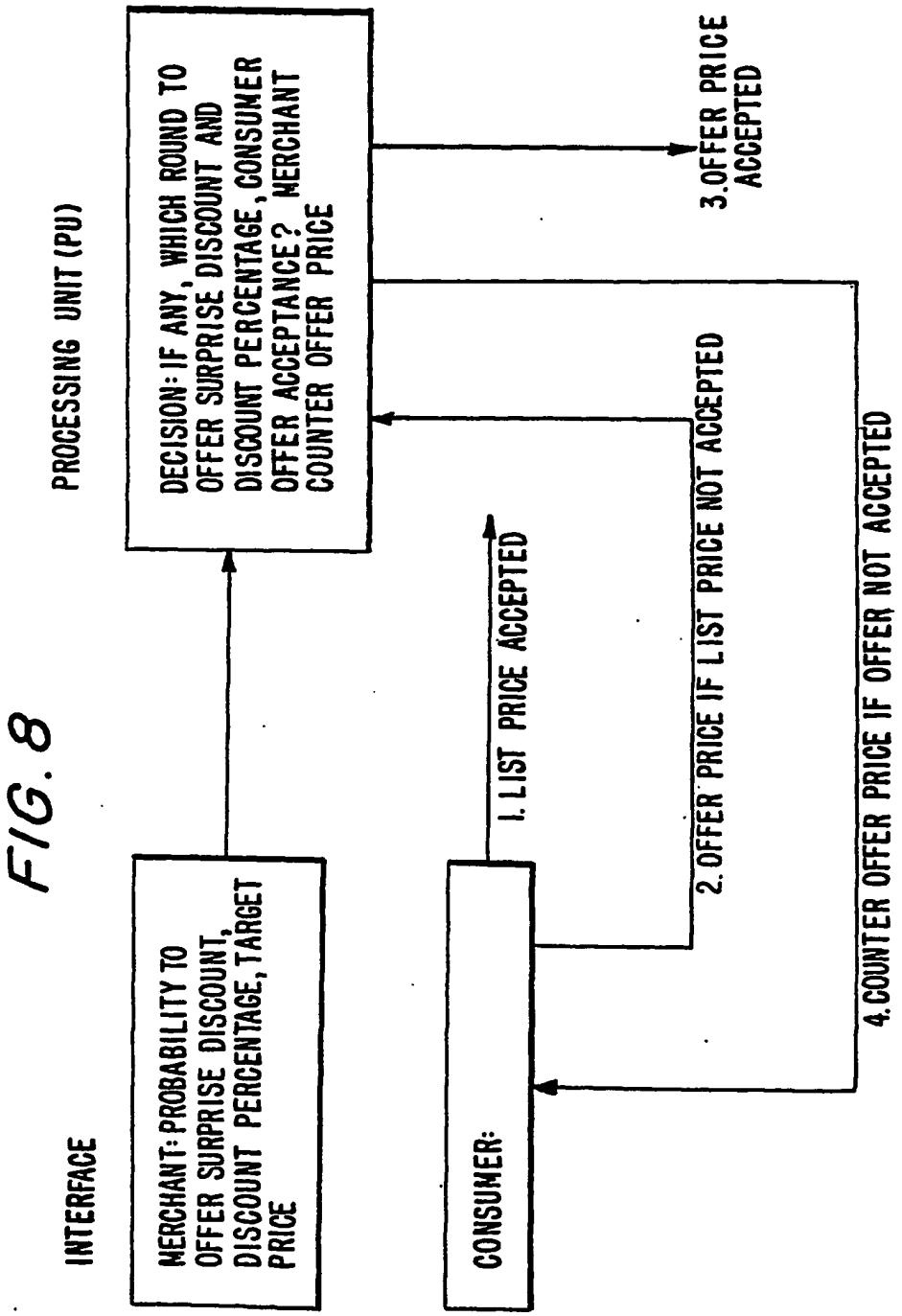

INTERFACE
PROCESSING UNIT (PU)
MERCHANT: PROBABILITY TO OFFER SURPRISE DISCOUNT, DISCOUNT PERCENTAGE, TARGET PRICE
DECISION: IF ANY, WHICH ROUND TO OFFER SURPRISE DISCOUNT AND DISCOUNT PERCENTAGE, CONSUMER OFFER ACCEPTANCE? MERCHANT COUNTER OFFER PRICE
CONSUMER:
1. LIST PRICE ACCEPTED
2. OFFER PRICE IF LIST PRICE NOT ACCEPTED
3. OFFER PRICE ACCEPTED
4. COUNTER OFFER PRICE IF OFFER NOT ACCEPTED

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06510

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G06F 17/60
US CL :705/37

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/37

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

IEEE, Dialog

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,794,207 A (WALKER et al) 11 AUGUST 1998 col 4, line 29, abstract, lines 1-7, 13-16 and Fig. 1; col 8, line 55, Fig. 1 (300, 200, 400) and Fig. 4 (430); Figs. 5, 18, and 19 (1910); col 9, lines 5-6; Fig. 5 (550); col 15, lines 46-48; abstract, line 2; Figs. 5-19; col 20, line 23; abstract, lines 1-7, 9-11, col 17, lines 31, 36, col 8, lines 60-61; Fig. 18 (1810) and col 20, lines 19-20.	1-57

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 25 MAY 2000	Date of mailing of the international search report 14 SEP 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer ALLEN R. MACDONALD Telephone No. (703) 305-9707

Form PCT/ISA/210 (second sheet) (July 1998)★